EG3013 Chip Data Sheet

High-power MOS tube, IGBT tube gate driver chip

Version change log

Version number	date	description
V1.0	2012-09-18	First draft of EG3013 data sheet

content

EG3013 chip data sheet **V1.1**

1. Features

ÿ High-end suspension bootstrap power supply design, withstanding voltage up to 100V ÿ Built-in dead zone control circuit Gate drive capability ÿ Dedicated to brushless motor N-channel MOS transistor, IGBT transistor gate drive ÿ HIN input channel is active high, control high-side HO output Fewer components ÿ Small quiescent current: 4.5mA ÿ Package type: SOP-8

2. Description

EG3013 is a cost-effective high-power MOS transistor and IGBT transistor gate drive dedicated chip, which integrates logic signal input processing circuit, dead-time control circuit, blocking circuit, level shift circuit, pulse filter circuit and output drive circuit. , dedicated to the drive circuit in the brushless motor controller.

The high-end working voltage of EG3013 can reach 100V, the power supply voltage range of Vcc is wide from 4.5V to 30V, and the static power consumption is only 4.5mA. The chip has a blocking function to prevent the output power tubes from being turned on at the same time. The input channel LIN has a built-in pull-up 5V high potential and HIN has a built-in 10K pull-down resistor. When the input is floating, the upper and lower power MOS tubes are turned off, and the output The structure adopts half-bridge Darlington tube structure and adopts SOP8 package.

3. Application areas

ÿ Electric motorcycle controller ÿ Electric bicycle controller ÿ 100V step-down switching power supply

ÿ Inverter water pump controller ÿ Brushless motor driver ÿ High voltage Class-D power amplifier

4. Pins

4.1. Pin Definition

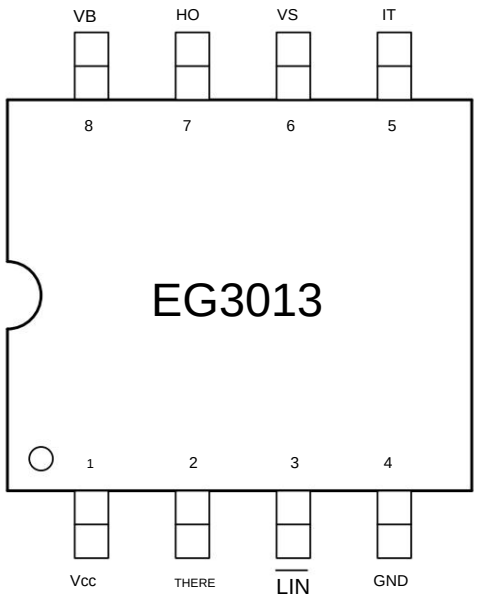

Figure 4-1. EG3013 Pin Definition

4.2. Pin description

Pin No.	Pin Name	I/O	describe
1	Vcc	Power	Chip working power input, the recommended working voltage is 10V-15V, an external high The frequency 0.1uF bypass capacitor can reduce the high frequency noise at the input of the chip
2	THERE		The logic input control signal is active at high level and controls the turn-on and turn-off of the high-end power MOS transistor. end. When the LIN pin is high, the HIN function is as follows (refer to Section 8.2 for details) "0" is to turn off the power MOS tube "1" is to turn on the power MOS tube
3	$\overline{\text{LIN}}$		The logic input control signal is active at low level, and controls the turn-on and turn-off of the low-end power MOS transistor. When the HIN pin is low, the LIN function is as follows (refer to Section 8.2 for details) "0" is to turn on the power MOS tube "1" is to turn off the power MOS tube
4	GND	GND	The ground terminal of the chip.
5	IT	O	output controls the turn-on and turn-off of the low-side MOS power transistor
6	VS	O	High-end floating end
7	HO	O	output controls the turn-on and turn-off of the high-end MOS power transistor
8	VB	Power	High-end floating power supply

5. Structure block diagram

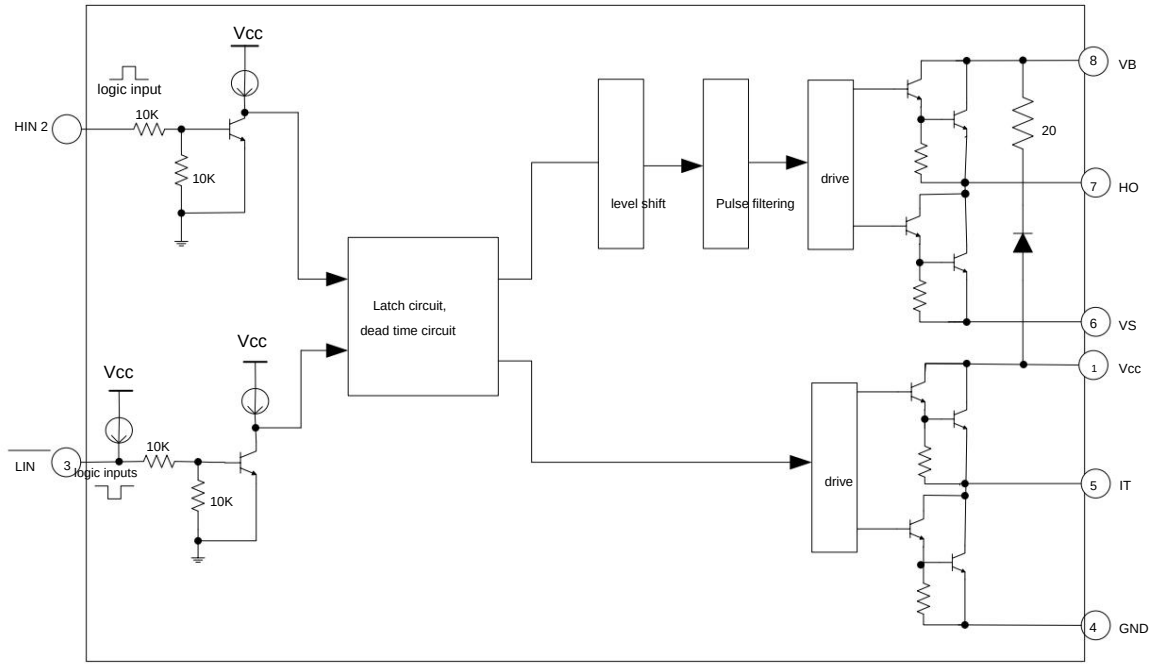

Figure 5-1. EG3013 block diagram

6. Typical application circuit

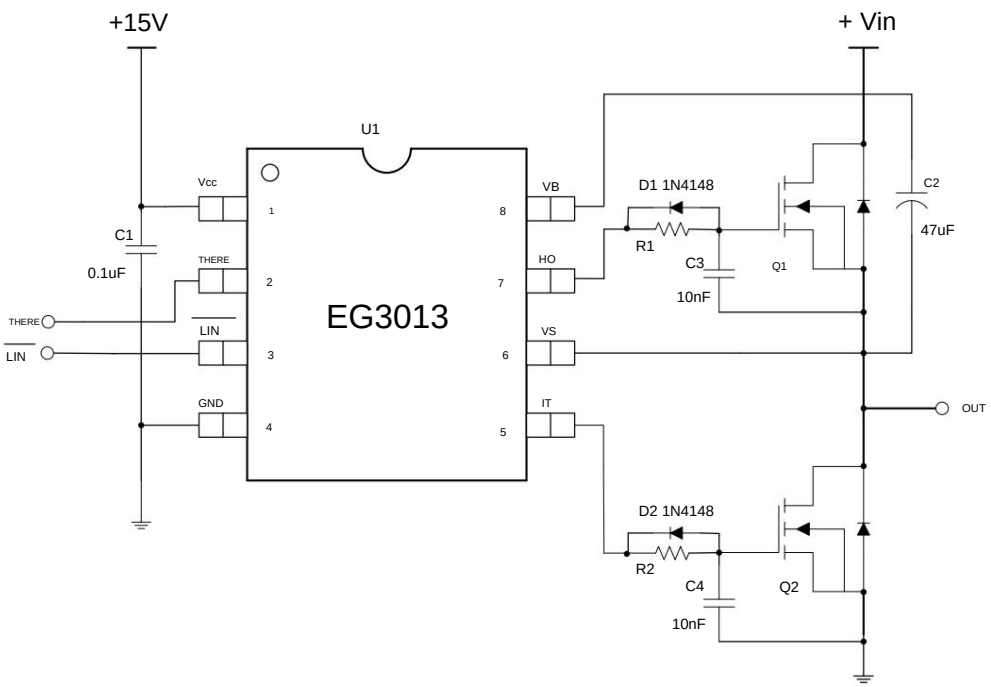

Figure 6-1. Typical application circuit diagram of EG3013 - medium and low power half-bridge driver application

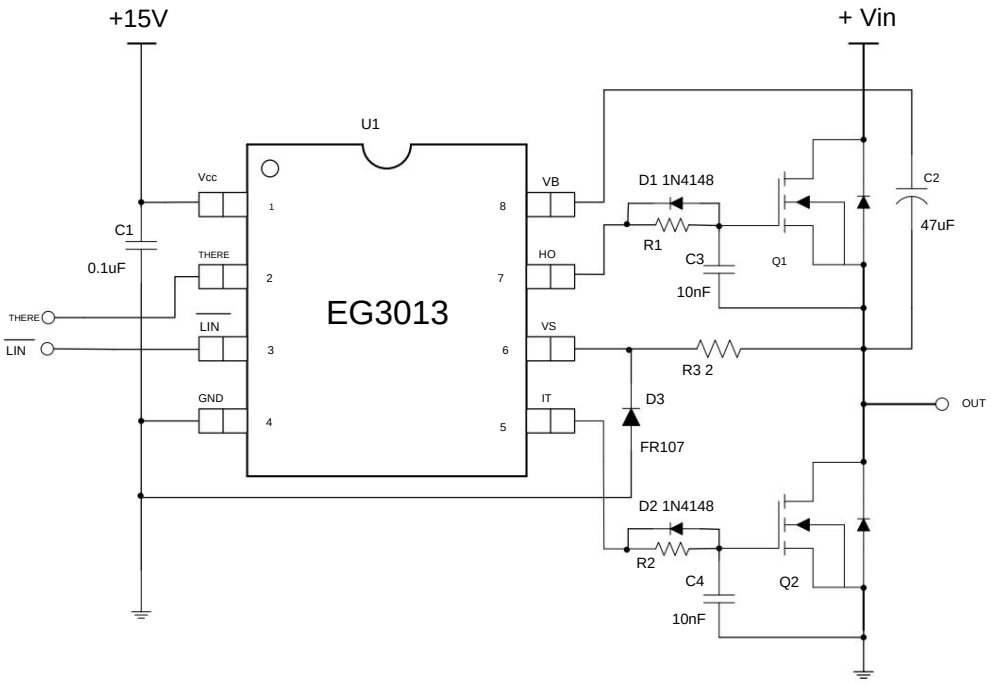

Figure 6-2. Typical application circuit diagram of EG3013 - high power motor application

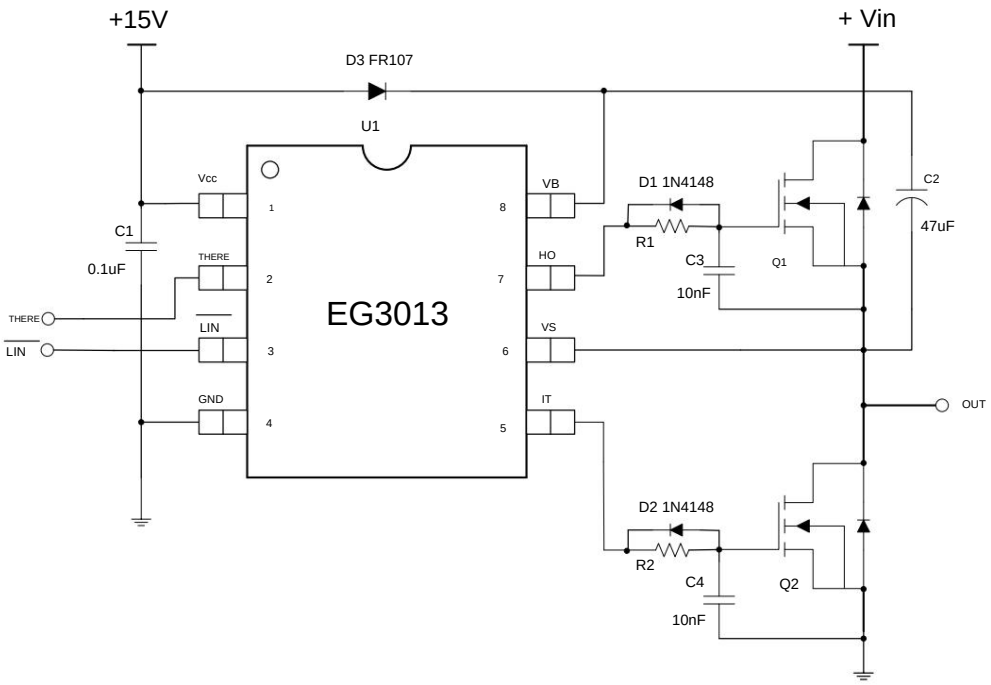

Figure 6-3. EG3013 Typical Application Circuit Diagram - External Bootstrap Diode Application

7. Electrical Characteristics

7.1 Limit parameters

Unless otherwise stated, under the condition of TA=25ÿ

Symbol	parameter name	Test Conditions Min Max Unit			
Bootstrap High Side VB Supply	VB		-0.3	100	IN
high-end suspension	VS		-0.7	100	IN
high end output	HO		-0.3	100	IN
low end output	IT		-0.3	35	IN
Power	VCC		-0.3	35	IN
High Channel Logic Signal Input level low	THERE		-0.3	35	IN
channel logic signal input level	LIN		-0.3	35	IN
PER	ambient temperature		-45	85	ÿ
Tstr	Storage temperature		-65	125	ÿ
TL	Soldering temperature	T=10S		300	ÿ

Note: Exceeding the listed limit parameters may cause permanent damage to the chip, and long-term operation under the limit conditions will affect the reliability of the chip.

7.2 Typical parameters

Unless otherwise stated, under the condition of TA=25ÿ, Vcc=15V, load capacitance CL=10nF

parameter name symbol power supply		Test Conditions Min Typical Max Units				
	Vcc		4.5	15	30	IN
Quiescent	Icc input floating, Vcc=15V -			4.5	6	mA
current input logic signal high	Vin(H) All input control signals 2.5			5.0		IN
Potential input logic signal low	Vin(L) -0.3 for all input control signals			0	1.0	IN
Potential input logic signal high level of the current	Iin (H)	Vin=5V		300	400	uA
input logic signal low level of current	Iin (L)	Vin=0V		0		uA
Low-Side Output LO Switching Time Characteristics						
On delay	Ton	See Figure 7-1		500	700	nS
off delay	Toff	See Figure 7-1		50	100	nS
Rise Time	Tr	See Figure 7-1		400	600	nS
fall time	Tf	See Figure 7-1		200	300	nS
High-side output HO switching time characteristics						
On delay	Ton	See Figure 7-2		300	500	nS
off delay	Toff	See Figure 7-2		400	600	nS
Rise Time	Tr	See Figure 7-2		400	600	nS
fall time	Tf	See Figure 7-2		200	300	nS
Dead Time Characteristics						
dead time	DT	See Figure 7-3, No load capacitance CL=0	80	120	400	nS
IO output maximum drive capability						
IO output source current IO+		Vo = 0V, VIN = VIH PWÿ10uS	0.6	0.8		A
IO output sink current IO		Vo = 15V, VIN = VIL PWÿ10uS	0.8	1		A

7.3 Switching time characteristics and dead time waveform

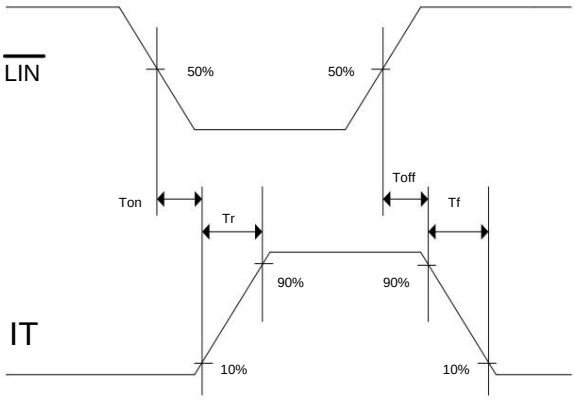

Figure 7-1. Low-Side Output LO Switching Time Waveform

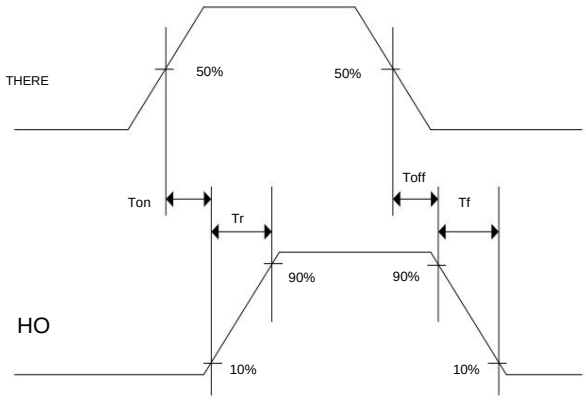

Figure 7-2. High-side output HO switching time waveform

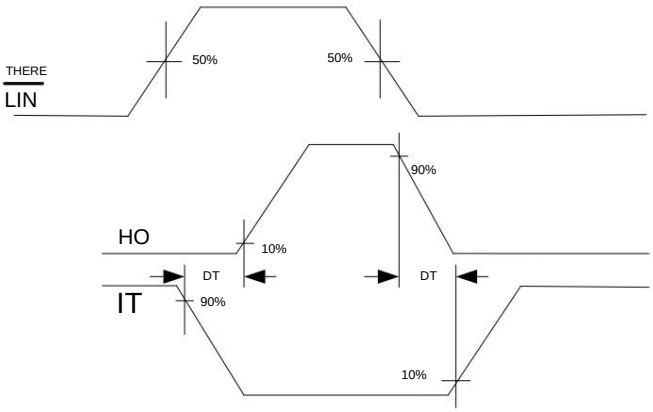

Figure 7-3. Dead Time Waveform

8. Application Design

8.1 Vcc terminal supply voltage

Considering that there is enough driving voltage to drive the N-channel power MOS transistor, the recommended power supply Vcc working voltage is typically 12V-15V, and the internal logic

The power supply of the logic circuit and the power supply of the analog level conversion circuit share the Vcc power supply, and the internal logic ground and the analog ground are also connected together.

8.2 Input logic signal requirements and output driver characteristics

The main functions of EG3013 are logic signal input processing, dead time control, level conversion function, suspension bootstrap power supply structure and upper and lower bridge diagrams

Pole output. The high-level threshold of the logic signal input terminal is above 2.5V, and the low-level threshold is below 1.0V. The output voltage of the logic signal is required.

The flow is small, so that the MCU output logic signal can be directly connected to the input channel of EG3013.

High-side high-side and low-side low-side totem-pole output drivers can sink up to 1A and output current up to 0.8A, high-side high-side

The arm channel can withstand a voltage of 100V, the conduction delay between the input logic signal and the output control signal is small, and the low-end output turn-on conduction delay is

500nS, turn-off conduction delay is 50nS, high-side output turn-on conduction delay is 300nS, turn-off conduction delay is 400nS. The low-side output is turned on on the

The rise time is 400nS, the fall time for turn-off is 200nS, the rise time for high-side output turn-on is 400nS, and the fall time for turn-off is 200nS.

The logic function diagram of input signal and output signal is shown in Figure 8-2:

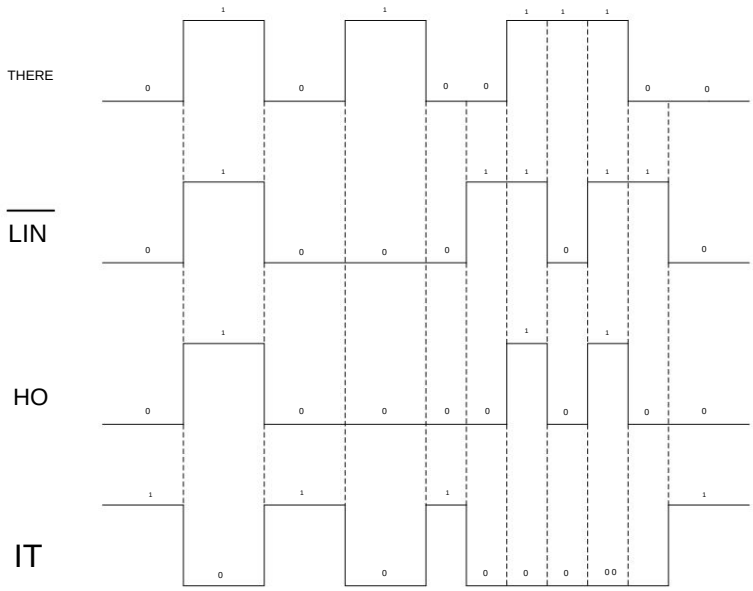

Figure 8-2. Input signal and output signal logic function diagram

Input signal and output signal logic truth table:

enter		output	
Input and output logic			
HIN (pin 4)	LIN (Pin 3) HO (Pin 7)		LO (pin 5)
0	**0**	0	**1**
0	1	0	0
1	0	0	0
1	**1**	**1**	0

It can be seen from the truth table that when the input logic signals HIN and LIN are not simultaneously "0" and not simultaneously "1", the driver controls the output HO and LO are "0" at the same time, the upper and lower power tubes are turned off at the same time; when the input logic signals HIN and LIN are "0" at the same time, the driver controls the output HO is "0", the upper tube is turned off, and LO is "1", the lower tube is turned on; when the input logic signals HIN and LIN are both "1", the driver controls the output HO When it is "1", the upper tube is turned on, and when LO is "0", the lower tube is turned off; the internal logic processor prevents the upper and lower power tubes of the controller output from being turned on at the same time, with phase Interlock function.

8.3 Bootstrap Circuit

EG3013 adopts the bootstrap suspension drive power structure to greatly simplify the drive power design. Only one power supply voltage VCC can be used to complete the driving of two power switching devices, the high-side N-channel MOS transistor and the low-side N-channel MOS transistor, which brings great advantages to practical applications. Come with great convenience. EG3013 can use The internal bootstrap diode or an external bootstrap diode as shown in Figure 8-3 and a bootstrap capacitor automatically complete the bootstrap boost function, assuming that the lower tube is turned on, When the upper tube is turned off, the C bootstrap capacitor has been charged to a sufficient voltage (Vc=VCC). When the HO output is high, the upper tube is turned on and the lower tube is turned off. The voltage on the lifting capacitor will be equivalent to a voltage source as the power supply of the internal drivers VB and VS to complete the driving of the high-side N-channel MOS transistor.

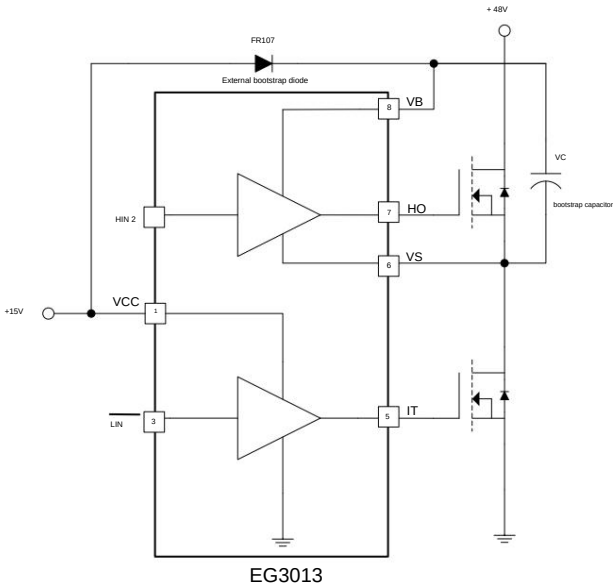

Figure 8-3. EG3013 Bootstrap Circuit Structure

9. Package size

9.1 SO8 Package Dimensions